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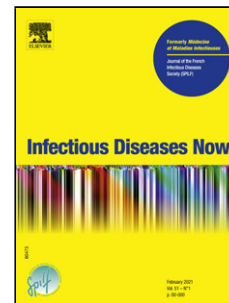
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Determinants of COVID-19 vaccine hesitancy in French hospitals

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Highlights

- Almost 50% of hospital workers were COVID-19 vaccine hesitant.

- Women, non-medical, younger, and private sector workers showed greater

  hesitancy.

- Specific concerns were observed according to the socio-professional status.

- Tailored oral and written information is needed to improve vaccination coverage.

- The majority of hospital workers were against mandatory vaccination.

Abstract

Objectives. COVID-19 vaccines have become the new hope for stemming the pandemic. We

aimed to assess pre-launch vaccine acceptance among hospital workers in the Auvergne-

Rhône-Alpes Administrative Region of France.

Methods. We performed a cross sectional study involving all hospital workers in 11

Auvergne-Rhône-Alpes hospitals in December 2020. Univariate and multivariate analyses

were performed to identify factors associated with vaccine hesitancy.

Results. We analyzed completed questionnaires from 1,964 respondents (78% women, mean age 42 years, 21.5% physicians, 41% private care centers). A total of 1,048 (53%) hospital workers were in favor of COVID-19 vaccination. Vaccine hesitancy was associated with: female gender; young age; paramedical, technical, and administrative professions (*i.e.,* all non-medical professions); no prior flu vaccination; and employment in the private medical care sector (*p*<0.05). Distrust of health authorities and pharmaceutical lobbying were the main obstacles to vaccination. Inversely, creating herd immunity and protecting patients and household members were the most frequently cited reasons in favor of vaccination. More than two-thirds of participants feared that the clinical and biological research was too rapid and worried about serious adverse effects. Most participants were interested in written information on the available vaccines, but the most vaccine-hesitant categories preferred oral information. Only 35% supported mandatory vaccination (Figure 1).

Conclusions. Targeted written and oral information campaigns will be necessary to improve vaccination coverage among hospital workers who show a surprisingly high hesitancy rate. Imposing mandatory vaccination could be counterproductive.

Background

Since the end of 2019, the world has been struggling with an unprecedented pandemic caused by the highly contagious severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). This crisis has overwhelmed health systems across the world, including those of high-income countries with respected health care systems such as France. Worldwide, hospital workers (HWs) have faced surges of infected patients in need of urgent, often intensive, care as the number of new cases soars day after day.

Although immunomodulatory treatments such as steroids can reduce mortality [1], only strict sanitary measures, including social distancing, the use of masks and regional or national lockdowns actually reduce the spread of the disease.

Effective prophylactic vaccines have been rapidly developed and widely dispatched [2,3]. In France, national vaccination campaigns were launched in late 2020. However, numerous studies highlighted increasing vaccine hesitancy in the general French population. Hesitancy was estimated at 25% in late spring 2020 [4], and reached 60% in December of 2020 [5]. Interestingly though, a monocentric French study [6] reported a similar rate of COVID-19 vaccine hesitancy in HWs, a population in direct contact with the consequences of the disease and, in principle, having knowledge on and an understanding of the necessity of vaccination. Moreover, hesitancy in HWs for COVID-19 vaccination was comparable to HWs hesitancy to influenza vaccination [7–9].

Thus, with this multicentric cross-sectional study, we sought to assess the rate of declared acceptance of COVID-19 vaccination in French HWs of the Auvergne-Rhône-Alpes (AURA) Administrative Region, to determine factors influencing their positions concerning vaccination, and to ascertain their acceptance of mandatory vaccination.

Patients and Methods

Study sample

This multicentric cross-sectional study was performed in 11 AURA hospitals, representing both public and private non-teaching hospitals (Centre Hospitalier de Valence, Centre Hospitalier de Bourgoin-Jallieu, Centre Hospitalier de Vienne, Clinique de l'Infirmerie Protestante de Lyon, Clinique de la Sauvegarde de Lyon, Médipôle Lyon-Villeurbanne,

Hôpital Privé de l'Est Lyonnais, Hôpital Privé Jean Mermoz, Centre Hospitalier Saint Joseph Saint Luc, Centre Hospitalier du Puy en Velay, Centre Hospitalier de Macon).

Survey

An online, anonymous, three-section, close-ended questionnaire was developed.

The first section comprised single-choice questions to determine sociodemographic characteristics (age, gender, profession, public or private sector employment, institution) and flu vaccination habits.

The second section comprised multiple choice propositions to assess the acceptance of COVID-19 vaccination. HWs with a favorable opinion of the vaccine could only respond to questions evaluating vaccine acceptance. These questions were: "If a COVID-19 vaccine deemed reliable and effective obtained marketing authorization, I would be in favor of vaccination against COVID-19 because: Even though I am not at risk of severe disease, I am afraid of having a severe form of COVID-19; I am at risk of severe COVID-19 (age >65 years, diabetes, high blood pressure, stroke, myocardial infarction, heart disease, renal or respiratory failure, cirrhosis, obesity, immunosuppression, cancer on treatment); I am pregnant and afraid for my baby (as far as data on pregnant women are available); I want to protect my loved ones; It will be recommended for healthcare professionals (I want to protect patients); I want to help create herd immunity and stop the epidemic. Inversely, HWs opposed to the vaccine could only answer questions about vaccine concerns by choosing from the following: I think I already had COVID-19; I have already had COVID-19 (confirmed case); I think COVID-19 is not severe; I don't think I am at risk of developing a severe form of COVID-19; I do not trust health authorities when they tell me that the upcoming vaccine is effective and without side effects; I do not like injections; The vaccine is

not natural; it provides artificial immunity that I do not need because I have good natural immunity (I am never sick); I am worried about pharmaceutical lobbying, which makes me distrustful of the vaccine; I am pregnant and afraid for my baby (as far as data on pregnant women are available); I have a medical contraindication to the vaccine.

The third section comprised five multiple choice propositions to probe fears about the then future vaccine, including: potential mild side effects (fever, pain at the injection site); potential serious side effects; the very short research phase for the vaccine; the potential composition of the vaccine (adjuvants, aluminum, conservatives); mRNA. This section also explored the desire for more information on COVID-19 and the vaccine (yes or no), how to deliver such information (oral, written or both), and the respondent's position (favorable or opposed) on mandatory vaccination.

The Human Resources Department of each facility sent the questionnaire to the professional e-mail addresses of all HWs on December 7, 2020. A reminder was sent one week later, and the investigation closed thereafter on the evening of December 19, 2020. Of note, the present study was conducted before the first vaccination campaign in France, launched on December 27, 2020 [10].

Outcomes

The primary outcome was the rate of declared acceptance of COVID-19 vaccination. The secondary outcomes were factors associated with such acceptance, feelings about mandatory vaccination, and the desire for more information.

Statistics

All data were collected and analyzed using SPSS Statistics software (IBM).

The association between COVID-19 vaccination intent and explanatory covariates: age group, gender, profession, and sector of activity (public or private) was analyzed using unconditional logistic regression models. The determinants associated with COVID-19 vaccination were analyzed by fitting an unconditional logistic regression model. To avoid possible overfitting on influenza vaccination status potentially highly correlated with COVID-19 vaccination intent, unconditional logistic regression models with and without the covariate influenza vaccination status were fitted. Twenty respondents with professions qualified as "other" or "not specified" were excluded from the analysis. Nested models were compared using likelihood ratio tests. Significance (two-tailed) was set at 0.05. Interactions between explanatory covariates were tested using a likelihood ratio test, with significance (two-tailed) at 0.10.

Concerning the statistics on desires for more information and attitudes on mandatory vaccination, 26 additional respondents were excluded due to missing data.

The study protocol complied with French data protection regulations and was approved by the local ethics committee (Valence hospital).

Results

1) Sample characteristics

A total of 2,067 HWs answered the questionnaire. Missing or invalid data led to 103 questionnaires being excluded, leaving 1,964 completed questionnaires for analysis. The sociodemographic characteristics of participating HWs are summarized in Table 1. Overall, age followed the Gaussian curve usually seen in HWs. Regarding professional categories, administrative workers made up 22.0% of the respondents, paramedical staff 44.6% (among whom 53.4% were nurses and 19.3% assistant nurses), physicians 21.5%, and

technical staff 10.8%. Another 1.0% of respondents listed "other" without further precision. All departments were represented. The private sector represented 41.1% of respondents. The percentage of study sample participants who declared to usually get the flu vaccine was 55.9%.

1) *Factors associated with COVID-19 vaccine acceptance*

Male sex was significantly associated with COVID-19 vaccine acceptance in univariate and multivariate analysis (OR=1.60 [1.22–2.08]). Age was also a cofactor of COVID-19 vaccination intent; the higher the age, the stronger the association ($p<0.005$).

Physicians were significantly more favorable to COVID-19 vaccine than other professions (OR=7.71 [5.45–10.91]). A significant interaction was observed between the covariates professions and the public/private type of activity. A difference was found between public sector physicians and private sector physicians; the first being much more COVID-19 vaccine acceptant (Table 2).

As expected, HWs who had themselves regularly received the flu vaccine were more likely to receive COVID-19 vaccination (OR=5.81 [4.67–7.21]). Regular influenza vaccination was strongly correlated with COVID-19 vaccination intent. The model that included influenza vaccination was overfitted, leading to a decrease in the strength of the effects of the other covariates, while they still remained significantly associated with COVID-19 vaccination intent (comparison of ORs in Table 2 and Table 3).

2) *Reasons of vaccine acceptance and hesitancy*

 A total of 1,048 (53.36%) HWs were favorable to COVID-19 vaccination if a safe and effective vaccine were to be launched. The three main factors driving their positioning were the desire to obtain herd immunity (78.1%), to protect their household contacts (71.8%), and to protect their patients (63.5%). The fear of developing severe COVID-19 or being at risk of

severe COVID-19 due to risk factors represented respectively only 26.6% and 7.1% of reasons for vaccine acceptance.

In an analysis not shown, we found that being a physician was associated to the desire to obtain herd immunity, while paramedical professions were associated to the desire to protect their loved ones ($p<0.005$). Elderly respondents (>50 years) were more afraid of developing severe COVID-19 than younger respondents ($p<0.005$).

Opposition to COVID-19 vaccination was expressed by 916 (46.6%) respondents. Their positioning was driven by mistrust of health authorities for 71.7% of them and mistrust of pharmaceutical lobbying for 54.9%.

Administrative, technical, and paramedical staff were non-significantly ($p=0.08$) more suspicious of health authorities and significantly ($p=0.045$) more suspicious of pharmaceutical lobbying than the medical staff was.

Twelve percent of respondents believed that the vaccine provided an artificial immune protection they did not need because of their good natural immunity. There was a statistically significant difference on this matter between physicians (0%) and other professions (between 11.8 and 15.1%).

Only 18 respondents declared a contraindication to the vaccine, reporting histories of either allergic reactions (52.2%), autoimmune diseases (17.4%), or post-vaccine reactions (17.4%). The main concern among the 1,944 HWs who answered the section on fears about the then future vaccine was that the research phase was too short (72.4%, including 59.9% of pro-vaccine respondents), followed by fears of serious adverse effects (67.2%, including 62.3% of pro-vaccine respondents), the composition (e.g., adjuvants, aluminum, conservatives) (35.2%), mRNA (24%), and common side effects (12.4%). Medical profession and age above 50 years were associated with a lower fear of serious adverse effects ($p<0.005$).

3) *Need for more information on COVID-19 and position on mandatory vaccination*

More information on COVID-19 and vaccination against it was desired by 78.2% of

respondents, with an overall preference for written (64.7%) rather than oral (35.3%)

information.

However, younger HWs, female HWs, and non-medical practitioners (*i.e.*, the most vaccine

hesitant) preferred oral information (*p*=0.02, *p*<0.001, *p*<.001, respectively).

Finally, 35.3% of respondents were in favor of mandatory vaccination, physicians (59.0%)

more so than paramedical (27.0%), administrative (32.4%) and technical (29.1%) staff

members (*p*<0.001). Mandatory vaccination was supported by 61.3% of the 1,048

respondents in favor of COVID-19 vaccination.

Discussion

The main finding of our cross-sectional study was that just before the launch of COVID-19

vaccination in France, barely more than half of respondents (53.4%) had a favorable opinion

of it. Our rate of approval was even lower than that of a previous French study, conducted in

late spring 2020, when no vaccine data was available [6].

Regarding the sociodemographic determinants of our sample, we found a significant positive

and independent association between vaccine acceptance and both male gender and

greater age. This association was independent of professional category, a finding consistent

with those of other studies [6,11,12]. COVID-19 is more severe and leads to higher mortality

in both men and the elderly [13,14], increasing fear of the disease in these populations, and

explaining this trend for vaccine acceptance. We observed a fear of serious side effects

particularly in younger caregivers, as did the authors of an Israeli study on COVID-19 vaccine

reluctance [15]. This population appears to see itself at lower risk of developing severe

COVID-19 but at higher risk of adverse effects from the vaccine, leading to misconception that the vaccine is more dangerous than developing the disease.

We also observed interprofessional discrepancies for vaccine intent, with non-medical workers much more opposed to vaccination than physicians. These results align with those of previous studies not only on COVID-19 [6,16] but also on influenza vaccination [7,8]. Lack of knowledge and lack of awareness are the most common reasons leading to vaccine hesitancy in HWs [17]. Lower socioeconomic status and education level, coupled with a lack of specific knowledge required to critically appraise some media sources and information accuracy are also correlated with vaccine hesitancy [12]. Furthermore, HWs should not only be considered as an extension of the health organization fully aware of medical knowledge, but also as ordinary citizens; when they estimate that risk is tangible and relevant, they behave and act like everyone else, basing their attitudes on emotions and personal experience rather than on analytical knowledge [18]. Just like the general population, HWs are exposed to and potentially influenced by the opinions of their families and friends, and sometimes by sensationalist, biased, or even "fake news" information sources. Moreover, negative comments on news articles have been shown to negatively affect neutral-opinion readers [19].

Interestingly, we observed that although public and private HWs expressed the same reasons for vaccine acceptance or hesitancy, the private sector physicians appeared to be significantly less favorable to vaccination than those in the public sector. To the best of our knowledge, our study is the first to highlight this difference, although it may vary depending on country and health system. For example, an opposite trend (higher rate of acceptance in the private sector) was observed among nurses in Hong Kong [9]. We believe this difference should be further explored.

Regular vaccination against the flu was strongly correlated with intention to get the COVID-19 vaccine. This phenomenon suggests a general vaccination habit and addresses the concept of vaccine hesitancy. We note that the concept of vaccine hesitancy is vague, covering not only people who have doubts about the vaccine but also those who are entirely vaccine reluctant. Personal positioning on vaccination is based on individual decision-making processes involving emotional, cultural, social, spiritual, and political factors as much as cognitive factors. Broader influences exist as well, such as the role of public health, vaccine policies and health professional and media communications, all grounded in a particular historical, political and socio-cultural context [20]. In our study, we preferred using "vaccine hesitancy" instead of "vaccine refusers" for all HWs who answered that they would not get the vaccine against COVID-19, because we believe that they can change their mind, when benefits will overtake perceived risks of vaccination. The aim of the question "do you usually get vaccinated against the flu" was to indirectly evaluate the proportion of "vaccine-hesitant" respondents in our sample, with the idea that flu vaccine-hesitant respondents were also COVID-19 vaccine-hesitant respondents. Our sample proved relatively tolerant to flu vaccination (55.9% favorable) in comparison to the French average in epidemiological databases, where vaccination coverage is usually around 35% among HWs. Specifically, that coverage was greater than 40% in the AURA region in 2018–2019 [21]. The declarative nature of the present study partly explains this result, with a probably greater participation of HWs interested in vaccination, resulting in a selection bias. However, high pro-influenza vaccination proportions can be found in other studies conducted in the same region. For example, a study performed in 2016–2017 reported a 46% rate of flu vaccination among 24% of HWs at the Hospital of Valence [22]. Also, an earlier study conducted in 2009 reported a 54.3% vaccination rate in the four University Hospital Centers in Lyon [7]. Although our HWs

were relatively favorable to flu vaccination and vaccination as a whole, they did seem to show higher hesitancy towards COVID-19 vaccination. This may suggest that the acceptance rate of COVID-19 vaccination throughout French hospitals might be even lower than what we report here. This frightening possibility must lead to further studies to better understand the reasons for refusing vaccines. Such information could empower improvements to communication strategies aimed at maximizing vaccination coverage [15,20].

Indeed with this study, we sought to gain insights into the main reasons of COVID-19 vaccine reluctance and the best means to counter them. Identified factors were mainly linked to safety, *i.e.*, concerns about the very short research period and the lack of post-vaccination hindsight. Those concerns reinforce mistrust of health authorities and pharmaceutical lobbies [23].

To fight against these concerns, the best global tactic seemed to be written information about COVID-19 and its vaccine. However, the most vaccine-hesitant respondents preferred oral information. In their analysis of vaccine hesitancy, Dubé *et al.* showed that communication adapted to the specific individual's concerns and doubts, mainly delivered by health professionals was a mainstay of vaccination strategies [20]. Furthermore, an Italian study showed the value of a vaccination strategy intended for HWs and deployed over 12 consecutive years in Palermo Hospital. Their targeted multifocal strategy (distribution of "I'm vaccinated" pins; dedicated flu days with informative conferences open to all; posters and flyers; dedicated, hash tagged pages on social networks and the Palermo Hospital website; on-site vaccination; mandatory dissent forms for HWs declining vaccination) increased flu vaccination from 5.2% to 32.7%, with a significant decrease in the average age of the vaccinated group and a decrease in absenteeism [8].

Support from several stakeholders will thus be required for COVID-19 vaccination. First, the government and health authorities must provide pro-vaccination messages to be relayed via both traditional media and social networks [8,12]. Mistrust in health authorities may be mitigated by messages from local intra-hospital stakeholders (such as public health physicians pharmacists or infectious diseases specialists) and extra-hospital stakeholders such as family physicians, who are convinced of the value of vaccination. Because of their professional likeness, these stakeholders may be better fitted to respond to the specific concerns and doubts of HWs [20].

Another way to reinforce COVID-19 vaccine acceptance is to insist on the positive benefits of vaccination. Appeals to altruism and the positive impacts of vaccination on the wider community are the primary motivators for COVID-19 vaccination [24]. The manner in which vaccination is proposed and the words chosen for doing so can contribute to improving acceptance. For example, asking a question such as "Would you be willing to get the vaccine to protect yourself and your family?" casts a more positive mindset than asking "How risky do you think it would be to get vaccinated?". Nonetheless, the latter question could be turned into an educational opportunity to correct misconceptions.

As far as misconceptions are concerned, a still widespread one among HWs is that a healthy immune systems makes vaccination unnecessary. Targeted intra-hospital information campaigns may be needed to address this specific issue.

The results of our study suggest that mandatory vaccination would be poorly accepted by HWs and thus likely ineffective for improving vaccination coverage among them.

Strengths of our study include the number and representativeness of the respondents, *i.e.*, 17.7% of the total workforce of the participating health centers. Furthermore, our study

surveyed all professional categories, not only the medical and paramedical staff but also the technical and administrative staff. These latter members of staff are not to be neglected in studies such as ours as they too are in close contact with patients and/or caregivers, and are thus a potential source of nosocomial transmission. They are also affected by COVID-19 and absenteeism among them contributes to overwhelming health care systems [25,26]. Importantly, our study revealed differences in perceptions between public and private sector HWs, an aspect that merits further study within the setting of COVID-19 and beyond.

One limitation of this study was how concerns and acceptance were evaluated. We did not explore positive aspects among vaccine-hesitant respondents or negative aspects among vaccine-acceptant respondents. This was a methodological choice on our part as we targeted a clear response to our principal outcome. Indeed, we sought to keep the questionnaire simple while collecting information on fears among vaccine-hesitant respondents relevant to vaccination campaigns. In a vaccine-hesitant individual, reasons against vaccination weight more than reasons in favor of vaccination. We thus focused on these negative reasons to better understand their positions with the end goal of improving vaccination coverage. However, we did ask all HWs what fears the vaccine inspired for them. That line of questioning revealed that about 60% of vaccine-acceptant respondents had fears about serious adverse effects and the short duration of research.

Another limitation of our study was the possibility of differences between intentions and actual acceptance behaviors. It would be of great interest to retrospectively compare intra- and post-pandemic vaccination behaviors to pre-pandemic behaviors. Such studies might include an assessment of vaccine acceptance after any introduction of vaccine mandates to counter hesitancy and increase vaccination rates.

Conclusion

This study provides concrete leads for intra-hospital COVID-19 vaccination campaigns. These

campaigns should first target younger paramedical, administrative, and technical HWs with

both written and oral information. Messages should be designed to increase confidence in

the safety of vaccination, to correct misconceptions, to raise knowledge and awareness, and

to overcome mistrust in authorities. All information channels should be used to deliver these

messages, including social networks. Local stakeholders such as infectious diseases

specialists, pharmacists, and family physicians could be valuable allies for this mission.

Additional studies will be required to assess effectiveness of the deployed information and

communication strategies and any changes over time in COVID-19 and general vaccinal

behaviors.

Contribution of authors

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ISSARTEL Bertrand MD: Validation, Investigation
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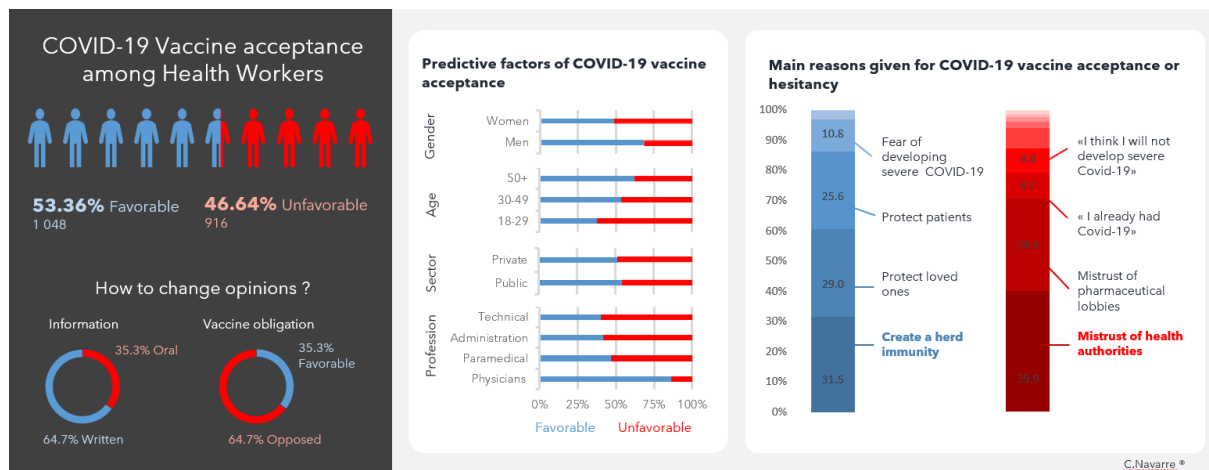
Figure 1. Graphical abstract of main study results.

Table 1. Sample characteristics and univariate analysis.

	Total (n=1,964)	Favorable to COVID-19 vaccine (n=1,048 (53))	Opposed to COVID-19 vaccine (n=916 (47))	p-value (Person's chi squared test)
Gender				
Female	1,532 (78)	751 (49)	781 (51)	0.001
Male	432 (22)	297 (69)	135 (31)	
Age				
18–29	306 (16)	115 (38)	191 (62)	<0.001
30–49	1,118 (57)	596 (53)	522 (47)	
50+	540 (27)	337 (62)	203 (38)	
Profession				
Administration[a]	432 (22)	180 (42)	252 (58)	<0.001
Paramedical staff[b]	876 (45)	410 (47)	466 (53)	
Physicians[c]	423 (22)	365 (86)	58 (14)	
Technical staff[d]	213 (11)	85 (40)	128 (60)	
Other	20 (1)	8 (40)	12 (60)	
Activity sector				
Public	1,157 (58)	633 (55)	524 (45)	0.15
Private	807 (41)	415 (51)	392 (49)	
Prior influenza vaccination				
Usually no	866 (44)	233 (27)	633 (73)	<0.001
Usually yes	1,098 (56)	815 (74)	283 (26)	

Number (%)

[a] Includes administrative staff, secretarial staff, non-nursing staff.

[b] Includes nursing assistants, nurses, midwifes, childcare assistants, cleaning agents, stretcher bearers, physiotherapists, dietitians, psychologists, social workers, radiology technicians, facilitators, pharmacy assistants, ambulance drivers, mortuary workers, specialist educators, psychomotor therapists.

[c] Includes physicians and surgeons, pharmacists, medical biologists.

[d] Includes technical logistics and informatics staff, medical information technicians, risk management coordinators, clinical research assistants, sterilization agents, catering agents, laundry agents, security agents.

Table 2. Factors associated with COVID-19 vaccine.

Multivariate analysis using logistic regression, with activity sector interaction.

	OR** (CI 95%)	p (LR* test)
Gender		**0.001**
Female	1 (Ref.)	
Male	1.60 (1.22–2.08)	
Age		**<0.001**
18–29	1 (Ref.)	
30–49	1.79 (1.35–2.37)	
50+	2.56 (1.86–3.51)	
Profession		**<0.001**
Profession – Activity sector Interaction		**0.007**
Public administration	1 (Ref.)	
Private administration	1.22 (0.82–1.80)	
Public paramedical staff	1.70 (1.25–2.33)	
Private paramedical staff	1.17 (0.84–1.63)	
Public physicians	13.38 (8.00–22.38)	
Private physicians	5.22 (3.31–8.23)	
Public technical staff	0.93 (0.61–1.42)	
Private technical staff	0.98 (0.53–1.79)	

* OR: Odds ratio

** LR: Likelihood ratio

Table 3. Factors associated with COVID-19 vaccine.

Multivariate analysis using logistic regression, with activity sector interaction, adding influenza vaccination habit.

	OR** (CI 95%)	p (LR* test)
Gender		**0.001**
Female	1 (Ref.)	
Male	1.64 (1.23–2.19)	
Age		**<0.001**
18–29	1 (Ref.)	
30–49	1.33 (0.98–1.81)	
50+	1.71 (1.21–2.42)	
Profession		**<0.001**
Profession – Activity sector Interaction		**0.007**
Public administration	1 (Ref.)	
Private administration	1.19 (0.77–1.82)	
Public paramedical staff	1.33 (0.94–1.87)	
Private paramedical staff	0.90 (0.63–1.30)	
Public physicians	6.60 (3.83–11.36)	
Private physicians	2.66 (1.63–4.34)	
Public technical staff	0.78 (0.49–1.23)	
Private technical staff	0.93 (0.48–1.80)	
Prior influenza vaccination		**<0.001**
Usually no	1 (Ref.)	
Usually yes	5.81 (4.67–7.21)	

* OR: Odds ratio

** LR: Likelihood ratio